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ABSTRACT

It was hypothesized that 1) prospective teachers who have been trained in microplanning will score higher on tests of teacher effectiveness and 2) will not change their attitudes about pupils and teaching in an undesirable direction. Subjects were 20 secondary school social studies majors, 10 who volunteered to take an experimental teacher education sequence (three 2-semester-hour courses titled Microplanning, Microteaching, and Clinical Teaching) and a control group of 10 taking the regular 6-semester-hour sequence. After the treatment, experimental group Ss were matched to control group Ss (on sex, class, cumulative GPA, and hours credit) and all Ss were given the same statement of objectives and unit booklet and randomly assigned five to ten high school pupils. They planned and taught four half-hour lessons to their pupils who were then administered a two-part test measuring recall of information and ability to reason using the material covered. The mean pupil scores for each S, computed for each part of the test, constituted the criterion measure of teacher effectiveness. The Minnesota Teacher Attitude Inventory (MTAI) and the Sorenson Teacher Role Preference Inventory (TRPI) were administered to the experimental group as pre-posttest along with a course evaluation questionnaire. Results of analysis of variance tests supported the hypotheses. (Brief description of microplanning competencies and procedures plus a sample lesson plan are included.) (JS)

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THE EFFECTS OF KNOWLEDGE ABOUT SUBJECT MATTER ON THE PERFORMANCE AND ATTITUDES OF PROSPECTIVE TEACHERS[1]

by
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This paper reports an experiment in which a treatment designed to help prospective teachers perform pretutorial teacher behavior was developed and tested. The treatment uses procedures similar to those used in microteaching. That is, tutorial teacher behavior is divided into its component parts each of which is defined and modeled. Practice in performing each behavior is given, and reinforcement is made contingent upon the successful performance of each behavior. (Allen, D.W.; McDonald, F.J.; and Orme, M.E.J., 1966). Therefore, we called our treatment microplanning.

Microplanning is designed to enable prospective teachers to perform pretutorial teacher behavior. Pretutorial teacher behavior not only precedes tutorial behavior in time, but it relates and explains such behavior. Research, cited below, indicates that pretutorial teacher behavior is related to pupil achievement. The problem of our research was to develop a treatment which would enable prospective teachers to perform pretutorial teacher behavior effectively.

RELATED RESEARCH

Cognitive learning theorists recognize that the amount and rate of learning is influenced by the nature of the subject matter itself, the way it is broken down, and the order in which it is presented. (Anderson, and Ausubel, 1965). Ausubel (Ausubel, 1960; Ausubel and Fitzgerald, 1962), has demonstrated that advanced organizers facilitate learning and retention. Bruner (1960) indicates learning is increased when experts have

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identified the structure of the body of subject matter to be taught. Gagne' (1965), develops a knowledge hierarchy of principles through an analysis procedure that begins by specifying the final principle, and then identifying each of the subordinate component ideas. He has found that the learning of "higher-level" materials was dependent on the mastery of prerequisite "lower-level" ideas in a highly predictable fashion. Ausubel (1965) claims that Ausubel, Bruner, and Gagne' agree that control over meaningful learning can be exercised most effectively by identifying and manipulating significant cognitive structure variables in three principal ways: (a) substantively, by showing concern for the structure of a body of subject matter, (b) programmatically, by employing suitable principles of ordering the sequence of subject matter, constructing its internal logic and organization, and (c) arranging appropriate practice trials. However, no attempts have been reported to develop a teacher training program that would enable prospective teachers to perform these pretutorial teacher behaviors.

Smith (1963; 1964; 1967b) has maintained that the quality of instruction would be increased if teachers could improve: 1) In their performance of logical operations, and 2) In the way they handle subject matter during the course of instruction. Smith (1962) has identified the logical operations teachers perform, and the types of subject matter they use. (Smith, 1967a)

Smith's second hypothesis that instruction would improve if teachers became more clear and rigorous in the way they handle subject matter inputs during instruction forms the basis for this study. This hypothesis is not only supported by the learning theorists, cited above, but is borne out in recent reviews of research on teaching. (Gage, 1968; Rosenshine, 1970; Turner, 1970). To our knowledge, however, no study has been reported in which Smith's (1967a) findings have been used to train teachers to manipulate and control subject matter.

HYPOTHESES

As pointed out it is Smith's view that teachers fail because they do not know how to work with subject matter

during the course of instruction. Our experience leads us to believe that the reason teachers lack clarity and rigor in the handling of subject matter during instruction is that they enter the tutorial situation without having planned their lessons effectively. We believe that the success or failure of tutorial behavior depends largely upon the quality of the pretutorial teacher behavior. Our hunch might be summed up this way: If you plan a good lesson you may teach a good lesson; if you plan a bad lesson you cannot teach a good one. Our objectives, therefore, are to help prospective teachers learn to plan good lessons; that is, identify their content objectives; know why the content objectives are held; and select appropriate strategies for teaching them. Our hypotheses are: 1) prospective teachers who have been trained in microplanning will score higher on tests of teacher effectiveness; 2) prospective teachers will not change their attitudes about pupils and teaching in an undesirable direction.

METHOD

Subjects

The subjects (Ss) in our experimental group were ten secondary school social studies majors who volunteered to take an experimental teacher education sequence.[2] Our control group consisted of ten Ss drawn from a pool of all social studies majors taking the regular teacher education sequence at ISU. The regular teacher education sequence consisted of a two semester hour course called American Public Education, and a four semester hour course called Secondary Education. The experimental treatment consisted of three courses each carrying two semester hours of credit. These courses were titled: Microplanning; Microteaching; and Clinical Teaching.

Data Sources

At the end of the treatment each S in the experimental group was matched to a control group member. Each match was

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[2] One member of the experimental group was unable to complete the entire experiment.

accomplished equating the members of each pair with respect to sex, class, cumulative GPA, and hours of university credit. All Ss were given the same statement of objectives, and a copy of the unit booklet titled, Negro Views of America, by Oliver and Newman, published by Xerox Corporation. Ss were randomly assigned from five to ten high school pupils drawn from study halls at University High School, at I.S.U. Ss planned and taught four half-hour lessons to their pupils on Monday through Thursday. On Friday Ss administered a test covering the material in the unit booklet. This test which comes with the unit booklet has an A level section which measures recall of information, and a B level section which measures the ability to reason using the material covered. The mean pupil score for each S was computed for each of the two levels of the test, and this constituted the criterion measure of teacher effectiveness used in this study.

Two tests were used in obtaining measures of attitudial changes. These are the Minnesota Teacher Attitude Inventory (MTAI) and the Garth Sorenson Teacher Role Preference Inventory (TRPI). These tests were administered to the experimental group on a pre-posttest basis. The MTAI is designed to measure those attitudes of a teacher which predict how well he will get along with pupils in inter-personal relationships and indirectly how well satisfied he will be with teaching as a vocation. The Teacher Role Preference Inventory has three sub-tests yielding five scales covering attitudes towards objectives, content, and methods. Generally these subtests measure attitudes lying along a progressive-traditional continuum. The final instrument used was a course evaluation questionaire which was developed especially for this study. This was administered to each S in the experimental group during a structured interview. The responses of each S was tape recorded, and a typescript was made for this tape of each interview.

Treatment

Microplanning

Microplanning consists of six competencies (see Figure I). These competencies grew out of the curriculum questions: Why

teach? (competencies 1 and 2), What to teach? (competencies 3 and 4) and How to teach? (competencies 5 and 6). They are designed to help prospective teachers to be clear and rigorous in the handling of subject matter during the course of instruction. The procedures used to teach each competency are based on behavior modification techniques. Microplanning began by having Ss select a high school text in their major field, and a chapter in that text to be planned. At the end of each phase of the treatment Ss demonstrated their competency by handing in their plans. The instructor used these written plans to determine the degree to which Ss had attained the competency. The following objectives and criterion measures were used for the micro-planning phase of the treatment:

1. Rationale: Given a body of subject matter Ss will be able to explain why they are going to teach it. In judging the statements handed in the instructor determined if the needs were clear; if they were significant; and if they made sense for the specific body of subject matter.

2. Objectives: Given a body of subject matter Ss will be able to state what the pupils will be capable of doing once they have successfully completed the unit. In judging objectives the instructor determined if they grew out of the needs; if they were listed correctly as cognitive, psychomotor, or affective; if they were stated unambiguously; and if they went beyond simple recall of subject matter.

3. Structure of Knowledge: Given a body of subject matter Ss will be able to state the most general concepts and propositions to be found in it. In judging the structure of knowledge the instructor determined if the propositions were clear; if the ideas were integrated; and if the total structure was cumulative.

4. Selecting and Organizing Content: Given a body of subject matter Ss will be able to determine their content objectives, and the subordinate component ideas needed to achieve them. Content objectives should be clear, integrated, and cumulative. Subordinate conponent ideas should be relevant to the content

objectives; consist of all necessary subordinate ideas; and arranged in a logical order.

In order to help Ss break down their chapters into lessons with several content objectives, and subordinate component ideas we adapted a classification system developed by B. O. Smith (1967[a]). Smith found that discourse in a lesson could be broken into units which he called ventures. Each venture consists of a set of utterances dealing with a single topic and having a single overarching content objective. Smith found eight types of ventures in his data. Each type of venture contains certain verbal actions that are ways of attaining the venture's objective. These are called moves. Moves are units of content found within a venture. A simplified version of Smith's classification system was used to help Ss identify the content objectives and subordinate component ideas in their lessons. The adaptation of Smith's categories used in the treatment is shown in Figure 2. Ss planned lessons which had at least three ventures each containing three moves. A typical lesson is shown in Figure 3.

5. Methods of Teaching: Given a body of subject matter Ss will select an appropriate method for teaching it. Ss were notified that they should use the lecture, recitation, discussion, and inquiry methods in their lesson plans. Generally the more indirect methods (discussion and inquiry) were to be used with the higher order content objectives.

6. Teaching Actions: Given a body of subject matter Ss will be able to determine the appropriate actions needed to teach it. Ss were instructed to use a variety of actions in their plans. These were judged appropriate in terms of the content objectives. As content objectives increased in magnitude the actions selected should be such that they elicit higher order responses from pupils.

Microteaching

Microteaching followed microplanning. Three of the nine weeks were used in training Ss to analyze lessons recorded on typescripts and videotapes. Ss were taught to analyze whether

the teacher behavior in the lesson was clear vs. vague; positive vs. negative; and indirect vs. direct. The remaining six weeks were used by Ss to teach each other their lessons previously planned, and to analyze each others teaching. A videotape machine was used to record and play back each lesson.

Clinical Teaching

Clinical teaching completed the treatment. Ss were assigned to a social studies teacher at the I.S.U. laboratory school. The clinical teacher was instructed to discuss his plans with Ss prior to his lesson; teach the lesson; and analyze the lesson after it was finished.

RESULTS

Table 1 displays for the subjects in both groups the mean pupil achievement scores on levels A and B of the unit test. The unweighted group means are given at the bottom of this table. An unweighted group mean is essentially the simple mean of all the mean pupil achievement scores for a level test. It is noteworthy that when the pairs of level B scores in Table 1 are examined, in all but two cases, the experimental subject of each pair out performed the control subject in terms of mean pupil achievement. This trend is not present in the level A scores for the pairs of subjects. To lend possible statistical support to these observations, a simple randomized blocks analysis of variance was utilized with the mean pupil achievement scores. This analysis was conducted once on the level A scores in both groups and again on the level B scores. Table 2 reports the results of these analyses. On level A which measured the recall of factual information there was no significant difference between the unweighted group means for the experimental and control groups. However, on level B which measured reasoning ability, the experimental unweighted group mean was significantly greater than the control unweighted group mean ($F=7.03$ with $F_{.95}(1,8)=5.32$). Here the significant difference of 2.15 in favor of the experimental group may not appear to be of unusual magnitude. However, it should be remembered that the analysis of variance design used in this portion of the study

lends a great degree of precision to the comparisons since the raw scores are themselves means and the subjects in both groups were carefully matched on cumulative G.P.A., sex, class, and hours of university credit. Thus the difference of 2.15 which is truly based on the means of two sets of means is indeed unusually large in a probability sense.

To test the difference between pre and posttest means for the experimental group on the two attitudinal instruments, a simple repeated measures analysis of variance was employed. The results of these analyses are summarized in Table 3. As was expected, the experimental treatment failed to produce significant changes between pre and post test means on the MTAI and the five scales of the TRPI. That is, the attitudes of the experimental subjects toward students, content, teaching method, and interpersonal style remained essentially unchanged at the conclusion of the treatment.

The interviews with Ss using the course evaluation questionaire yielded more data than can be reported here. Therefore, we limited ourselves to reporting responses which dealt with the treatment, and which were made by at least 40% of the Ss. In their reactions to microplanning Ss (60%) said that they would like an opportunity to adapt the planning procedures presented to them instead of having to follow them explicitly. However Ss (50%) felt that they were prepared for student teaching; that they (40%) knew how to plan units and lessons; and that they (40%) were better prepared to teach than students in the regular sequence. Ss (50%) liked the course in microteaching because of the feedback they received on their teaching behavior. However, many Ss (40%) felt that microteaching is an artificial situation. The course in clinical teaching was critized by most Ss (60%) because it lacked integration with the previous courses. Ss complained of a lack of communication between their laboratory school instructors, and their college instructor.

DISCUSSION

The results reported above suggest that greater pupil achievement in using a body of subject matter to solve problems is produced by prospective teachers trained in

microplanning. Further that training which places heavy emphasis on helping prospective teachers learn to manipulate and control subject matter does not result in the development of attitudes which would be considered undesireable by teacher educators.

Many teacher educators are currently engaged in teaching people to teach by having them master one at a time a given set of tutorial teacher behaviors. A recent study (Ward, 1969) has shown that microteaching is rapidly being adopted by teacher training institutions throughout the United States. Yet research in both learning, and teaching indicates that a strong relationship exists between pupil outcomes, and the degree of clarity and rigor a teacher can achieve with respect to the manipulation and control of subject matter. Our study leads us to believe that teachers cannot be clear and rigorous in handling subject matter inputs during the course of instruction unless they have learned to perform pretutorial teacher behaviors. That is, prospective teachers have to learn how to solve problems having to do with purpose, content, and method before they engage in tutorial behavior. We feel that the use of behavior modification techniques to reinforce prospective teachers for performing such tutorial responses as establishing a set; achieving closure; providing feedback, etc., could lead prospective teachers to have an oversimplified view of teaching. It might be that prospective teachers should never be allowed to engage in tutorial behavior before they have demonstrated their competence in performing pretutorial teacher behavior. Microteaching unless preceeded by successful performance in microplanning could be a case of misplaced emphasis.

FIGURE 1.

Microplanning Competencies and Procedures

	Rationale	Behavioral Objectives	Knowledge Structure	Selecting Content	Teaching Methods	Teaching Actions
A. Define Behavior						
B. Model Behavior						
C. Practice Behavior						
D. Evaluate Behavior						

FIGURE 2.

Adaptation of Smith's (1967[a]) Categories
for Use in Microplanning

1. VENTURES LOWER COGNITIVE DOMAIN. The teacher helps pupils grasp subject matter dealing with a single topic and having a primary cognitive meaning.

1.1 Conceptual Venture. The meaning, uses, or implications of a term are noted and discussed.

1.11 Descriptive moves. Information about the term is noted and discussed.
1.12 Comparative moves. The concept is compared with some other concept.
1.13 Instantial moves. Specific instances of the term are noted or discussed.

1.2 Particular Venture. A topic or group of related topics is explicated. This would include consideration of an object, event, person or place.

1.21 Particular identifying moves. Information directly concerned with the particular is noted or discussed.
1.22 Relating moves. The particular is related to other objects, events, or conditions.
1.23 Appraisal moves. The value or significance of a particular is noted or discussed.

1.3 Rule Venture. Conventual ways of performing actions is described or discussed.

1.31 Formulation moves. A rule is presented and its purpose clarified.
1.32 Justification moves. The rule is made plausible.'
1.33 Application moves. Actions guided by the rule are described in relation to some specific situation.

2. VENTURES HIGHER COGNITIVE DOMAIN. The teacher helps pupils use or apply subject matter dealing with a single topic and having a primary cognitive meaning.

2.1 Interpretative Venture. Pupils transform subject matter in order to demonstrate they comprehend its meaning, significance, or reason.

2.11 Explication moves. The literal meaning, significance, or reason for something is given.
2.12 Extrapolation moves. Inferences that go beyond the literal meaning, significance, or reason are made.
2.13 Evidential moves. Support or denials that the inferences made are correct is given.

2.2 Procedural Venture. Subject matter is used to decide upon a sequence of actions (symbolic or manipulative) by which an end may be achieved.

2.21 Problem moves. The problemmatic situation is defined or clarified.
2.22 Performance moves. Actions which must be taken in order to solve the problem are noted or discussed.
2.23 Proceudre moves. Actions are abstracted, summarized, or generalized.

2.3 Evaluative Venture. Pupils apply subject matter in order to determine the truth or worth of something.

2.31 Identification moves. The value object or event is clarified before it is rated.
2.32 Rating moves. A rating is made, and reasons (criteria) given which substantiate the rating.
2.33 Justification moves. The rating is discussed, and alternatives are considered.

FIGURE 3.

Sample Lesson Plan

UNIT TITLE: Using Land Within Its Capability.

LESSON TITLE: What Are The Differences In Surface Features?

OBJECTIVE: The student will be able to evaluate important land features selecting correct classifications from arbitrary categories to assign to these features.

INTENT	CONTENT	METHOD
Particular	1. Slope influences the speed with which water runs off a field and the amount of soil that washes with the water. a. Slopes can be measured by three different kinds of levels. b. Slopes are classified as nearly level, gently sloping, moderately sloping, and strongly sloping. c. Surface runoff is the greatest force in erosion of topsoil.	Lecture: I will present a background of slope of soil to the students. Materials: Lecture Notes Text
Conceptual	2. Erosion means the amount of original topsoil that has been carried away. a. Topsoil is the richest part of the soil. b. We measure the amount of topsoil by using a soil probe. c. Types of erosion range from no apparent erosion to very severely gullied.	Recitation: I will head a discussion where the students will be lead into the idea of erosion degrees. Materials: Text Blackboard
Procedural	3. How can farmers prevent erosion? a. Increase in slope presents increased possibility of soil washing. b. There are several ways to decrease the amount of slope. c. It is the farmer's job to stop soil washing and maintain maximum topsoil.	Discussion: Students will be divided into two groups and asked to arrive at a solution to the problem of erosion. Materials: Pictures and charts

TABLE 1.

Mean Pupil Achievement Scores for Each Subject on Levels A and B of Unit Test on "Negro Views of America"

Matched Pair	Experimental Group				Control Group			
	Subject Name	No. of Pupil Results	Mean Pupil Achievement Level A	Mean Pupil Achievement Level B	Subject Name	No. of Pupil Results	Mean Pupil Achievement Level A	Mean Pupil Achievement Level B
1	J.F.	5	18.0	20.0	P.W.	5	21.2	18.8
2	P.G.	7	18.6	18.6	C.S.	7	18.6	16.9
3	S.G.	7	20.9	19.9	C.A.	7	18.0	14.4
4	D.H.	8	20.5	24.0	J.B.	4	21.5	18.0
5	K.H.	8	20.5	21.4	S.P.	9	18.9	20.2
6	D.M.	7	22.4	25.0	J.W.	5	24.4	25.0
7	R.S.	4	24.0	25.3	H.K.	6	22.3	21.3
8	G.T.	7	20.3	21.1	T.G.	6	24.3	21.7
9	P.W.	8	20.6	22.6	R.J.	8	20.5	22.3
Unweighted Group Means			20.64	21.99			21.08	19.84

TABLE 2.

Tests of Differences Between Unweighted Group Means of Table 1.

Test Level	Means		Difference (Exp.-Control)	F
	Experimental Group	Control Group		
A	20.64	21.08	-.44	.31
B	21.99	19.84	2.15	7.03*

*$p < .05$, $F(1,8)=5.32$

TABLE 3.

Tests of Differences Between Pre and Post Test Means of the Experimental Group on the Minnesota Teacher Attitude Inventory (MTAI) and the Garth Sorenson Inventory (TRPI).

Scale	Means		Difference (Post-Pre)	F
	Pre-Test	Post-Test		
MTAI	50.10	55.10	5.00	.58
TRPI-Student Orientation	54.11	54.56	.45	.06
TRPI-Social Orientation	48.11	45.33	-2.78	1.29
TRPI-Subject Orientation	41.78	44.11	2.33	.74
TRPI-Didactic Method	19.78	19.89	.11	.13
TRPI-Interpersonal Warmth	30.89	31.11	.22	.31

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